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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/722,700

11/25/2003

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139081-1(GERD:0662)SWA

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41838 7590 05/22/2009
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EXAMINER

MCCRACKEN, DANIEL

ART UNIT

PAPER NUMBER

1793

MAIL DATE

DELIVERY MODE

05/22/2009

PAPER

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The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte LOUCAS TSAKALAKOS, JI-UNG LEE,
WILLIAM HULLINGER HUBER,
REED ROEDER CORDERMAN,
and VANITA MANI

Appeal 2009-002875
Application 10/722,700
Technology Center 1700

Decided:¹ May 22, 2009

Before EDWARD C. KIMLIN, TERRY J. OWENS, and
JEFFREY B. ROBERTSON, *Administrative Patent Judges*.

KIMLIN, *Administrative Patent Judge*.

DECISION ON APPEAL

¹ The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

This is an appeal from the final rejection of claims 30, 32-52, and 54-72. Claims 30 and 44 are illustrative:

30. A field emission device, comprising

a substrate having a top side and an opposite bottom side;

a conductive epitaxial buffer layer affixed to the top side of the substrate;

a dielectric layer disposed on the top side;

a conductive layer disposed on top of the dielectric layer opposite the substrate, the conductive layer and the dielectric layer defining a cavity extending downwardly to the substrate; and

at least one nanorod affixed to the substrate via the conductive epitaxial buffer layer and substantially disposed within the cavity, wherein the conductive epitaxial buffer layer remains after formation of the at least one nanorod.

44. A field emission device, comprising

a substrate having a top side and an opposite bottom side;

a dielectric layer disposed on the top side;

a conductive layer disposed on top of the dielectric layer opposite the substrate, the conductive layer and the dielectric layer defining a cavity extending downwardly to the substrate;

a conductive platform, having a top surface, disposed on the top side of the substrate within the cavity, wherein the conductive platform is independent from catalyst particles configured to grow the at least one nanorod, and the catalyst particles are disposed in a channel; and

at least one nanorod affixed to the top surface of the conductive platform and substantially disposed within the cavity.

The Examiner relied upon the following as evidence of obviousness:

Kane	5,157,304	Oct. 20, 1992
Narayan	5,406,123	Apr. 11, 1995
Xu	5,973,444	Oct. 26, 1999
Hunt	6,054,801	Apr. 25, 2000
Linthicum	6,255,198 B1	Jul. 3, 2001
Rowell	6,376,007 B1	Apr. 23, 2002
Jin	6,465,132 B1	Oct. 15, 2002
Paranthaman	2002/0198112 A1	Dec. 26, 2002
Laude	6,586,093 B1	Jul. 1, 2003
Takai	6,911,767 B2	Jun. 28, 2005

Appellants' claimed invention is directed to a field emission device comprising a substrate having coated thereon a conductive epitaxial buffer layer, a dielectric layer, and a conductive layer deposited on the dielectric layer. The conductive and dielectric layers define a cavity which extends downwardly to the substrate. Also, nanorods are affixed to the substrate via the conductive epitaxial buffer layer. Claim 44 on appeal defines a conductive platform on a substrate within the cavity that is independent from catalyst particles configured to grow the nanorods. The nanorods are affixed to the top surface of the conductive platform.

The appealed claims stand rejected under 35 U.S.C. § 103(a) as follows:

(a) claims 30, 35, 36, 38-40, 42-51, and 56-68 over Xu in view of Linthicum,

(b) claim 32 over Xu in view of Lithicum and Kane,

(c) claim 33 over Xu in view of Lithicum and Hunt,

(d) claim 34 over Xu in view of Lithicum, Jin, and Takai

(e) claims 37 and 52 over Xu in view of Lithicum and Rowell,

(f) claim 41 over Xu in view of Lithicum and Laude,

- (g) claims 54-55 and 69-72 over Xu in view of Narayan,
- (h) claims 30, 35, 36, 38-40, 42-51, and 56-68 over Xu in view of Paranthaman,
- (i) claim 32 over Xu in view of Paranthaman in view of Kane,
- (j) claim 33 over Xu in view of Paranthaman and Hunt,
- (k) claim 34 over Xu in view of Paranthaman in view of Jin and Takai,
- (l) claims 37 and 52 over Xu in view of Paranthaman in view of Rowell,
- (m) claim 41 over Xu in view of Paranthaman in view of Laude,
- (n) claims 54 and 55 over Xu in view of Narayan.

Appellants argue claim 30 and the claims dependent thereon as a group as well claim 44 and its dependent claims as group. Accordingly, the claims dependent upon claim 30 stand or fall together with claim 30, as do the claims dependent upon claim 44 stand or fall together with claim 44.

We have thoroughly reviewed each of Appellants' arguments for patentability. However, we are in complete agreement with the Examiner that the claimed subject matter would have been obvious to one of ordinary skill in the art within the meaning of § 103 in view of the applied prior art. Accordingly, we will sustain the Examiner's rejections for the essentially those reasons expressed in the Answer, and we add the following primarily for emphasis.

We consider first the Examiner's § 103 rejection of independent claim 30. There is no dispute that Xu, like Appellants, discloses a field emission device comprising a substrate coated with dielectric and gate metal layers, 16 and 15, which define a cavity extended downwardly to the

substrate, with a conductive metal catalyst layer 14 within the cavity on the substrate, which conductive layer 14 has affixed thereto nanorods 20. As acknowledged by the Examiner, Xu does not expressly teach that metal catalyst layer 14 is an epitaxial layer. However, Appellants have not rebutted the Examiner's legal conclusion that, based on the Linthicum disclosure, it would have been obvious for one of ordinary skill in the art to form metal layer 14 of Xu as an epitaxial layer "in order to take advantage of the reduced defects produced by epitaxial growth" (page 4 of Answer, second paragraph).

It is Appellants' argument that the metal catalyst film of Xu "is meant to dissolve into the gate metal during the heating in the process of formation of the nanorods" (page 14 of principal Brief, first paragraph). Appellants maintain, therefore, that the catalyst film of Xu will not remain when the nanorods are formed as required by claim 30. However, as emphasized by the Examiner, Appellants' argument misses the thrust of the Examiner's rejection. As is readily apparent from Xu's figure 1, the metal catalyst of Xu that is removed during heating is on gate metal layer 15, not metal catalyst layer 14. Clearly, metal catalyst layer 14 remains after formation of the nanorods 20 and serve to affix the nanorods to the substrate 12. We note that Appellants make no specific argument that catalyst layer 14 of Xu is removed during heating.

We now turn to the § 103 rejection of claim 44. Claim 44 requires a conductive platform on the substrate within the cavity wherein the platform is independent from catalyst particles which grow the nanorods. We agree with the Examiner that catalyst metal film 14 of Xu meets the

requirement for a conductive platform on the substrate within a channel. Appellants submit that “Xu fails to teach or suggest any structure which is employed to raise the level of nanorods close to the gate opening” (page 17 of principal Brief, second paragraph). However, we agree with the Examiner that this argument is not germane to the subject matter of claim 44 which fails to recite any relationship between the level of the nanorods and the gate opening. Claim 44 only requires nanorods affixed to the conductive platform and substantially disposed within the cavity. The metal catalyst layer 14 of Xu serves a conductive platform and has nanorods affixed to its top surface and is substantially disposed within the cavity.

Appellants also submit that “claim 44 recites that the ‘catalyst particles are disposed within a channel’ in the conductive platform to facilitate the growth of the nanostructures” (page 17 of principal Brief, alternate paragraph). Again, this argument is not germane to the claimed subject matter. Claim 44 does not recite that the channel is in the conductive platform. We concur with the Examiner that claim 44 only requires that the conductive platform is disposed in a channel, and it can not be gainsaid that the conductive platform 14 of Xu is disposed within the cavity formed by the dielectric and gate metal layers.

As for the § 103 rejection of claim 54, we agree with the Examiner that Narayan evidences the obviousness of adding a polycrystalline diffusion barrier to the top of Xu’s substrate “in order to prevent diffusion or to retard the inter-diffusion of the two superposed metals” (page 8 of Answer, alternate paragraph). The same analysis applies to the § 103 rejection of independent claim 55.

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Appellants submit essentially the same non-persuasive arguments against the § 103 rejection based on Xu and Paranthaman.

As a final point, we note that Appellants based no arguments upon objective evidence of nonobviousness, such as unexpected results.

In conclusion, based on the foregoing and the reasons well stated by the Examiner, the Examiner's decision rejecting the appealed claims affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R § 1.136(a)(1)(iv).

AFFIRMED

PL initial:
sld

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